REMARKS

Applicants acknowledge the First Office Action of 4 MAR. 2004 and request reconsideration of the claims, as amended.

Responsive to Paragraph 5 of the Action, FIG. 1 illustrates an electronically commutated motor (ECM) which differs from the prior art by including the program-control elements represented by boxes 42 and 43. Therefore, it would not be accurate to place a PRIOR ART legend on FIG. 1. Specification page 4, last two paragraphs (lines 21-33) already make clear that elements 42 and 43 represent novel features of the invention, so it is not believed necessary to amend the specification at this time, despite the suggestion in Paragraph 8 of the Action.

Responsive to Paragraphs 6-7 of the Action, the Preliminary Amendment of 28 MAR. 2001 already inserted customary US headings into the (translated PCT) text, and removed improper references to the content of the claims. The examiner is requested to have PTO clerical staff enter these amendments, if this has not yet been accomplished. Please note that the Preliminary Amendment also identified corresponding US patent texts, which will avoid the need for English-speaking readers to consult the corresponding German texts.

With respect to Paragraph 9 of the Action, the Examiner is correct in concluding that reference numerals are not to be interpreted as claim limitations, since MPEP section 608.01(m) clearly sets forth this PTO policy, and says that use of reference numerals in claims is nevertheless permitted. A number of the parenthetical references have been stricken from the claims.

In accordance with the Examiner's suggestion in Paragraph 10, a colon has been inserted after "comprising" in the claims.

Responsive to Paragraph 12 of the Action, claims 1 and 4 have been clarified. The "time variable" recited in the claims is a time interval which rotor 39 needs, in order to rotate through a predetermined angular distance. For example, this could be a half (180 degree) turn or a quarter (90 degree) turn. This time interval is specified by starting a timer at a first predetermined rotor position and stopping the timer at a second predetermined rotor position (see FIG. 6B) but an additional event can also occur, requiring a supplemental calculation (see FIG. 7B). The important thing is that this defined first time interval be exactly determined, so the term "ascertaining" has been substituted for the former expression "sensing" in order to convey the meaning that calculation steps may also be included in the "ascertaining."

Responsive to Paragraph 13 of the Action, the parenthetical steps have been deleted from claim 1, and corresponding changes have been made in claim 4. This removes any indefiniteness from claims 1 and 4.

Responsive to Paragraph 14, the Examiner's attention is respectfully directed to specification pages 26ff. According to page 26, last paragraph,

for motor control, it is important, what is the relative priority of a rotor-position-dependent Hall interrupt and a timer interrupt, in case these interrupts happen simultaneously. Referring to FIG. 6B, the theoretical timer-interrupt of FIG. 6B would be, under fast-acceleration conditions, to the right of Hall-interrupt HN+1. Conversely, the time interrupt in FIG. 7B is to the left of Hall interrupt HN+1, representing "early ignition" at high rotation speeds. Between the conditions of FIG. 6B and that of FIG. 7B, the timer interrupt can migrate from the sector to the right of the Hall interrupt into the sector to the left of the Hall interrupt. This presents the possibility that the Hall interrupt and the timer interrupt could occur more or less simultaneously, so it is necessary to specify which interrupt the microprocessor should execute first.

FIG. 5, mentioned by the Examiner, shows only the case of "early ignition" according to FIG. 7B (see specification page 9, second par.) and FIG. 5 thus does not illustrate a situation of simultaneous interrupts.

Responsive to paragraph 15 of the Action, claim 8 has been clarified.

Responsive to paragraph 16, claims 1-9 have been amended to provide proper antecedent basis.

Responsive to paragraph 17, the meanings of the time variables have been clarified. The method steps clearly define, how such a value for the time variable can be ascertained. Step f) has also been clarified; the calculation of the sum leads to a new value for the time variable (see FIG. 5, t_HN, t_HN+1, etc).

Responsive to paragraph 18, claim 38 has been clarified. This refers particularly to FIG. 18, in which the time interval t_HN begins at Hall interrupt HN-1 and ends at Hall interrupt HN. From the value t_HN, the value t_TI is determined, and this is used to specify when commutation occurs, measuring from Hall interrupt HN+3 and a rotor turn after Hall interrupt HN-1.

Claim 38 recites a "first angular rotor position that is reached again after one rotor revolution" since the timing is not predetermined but it dynamically calculated, during operation, by the control circuit.

Responsive to paragraph 19, claims 31-41 have been amended, in accordance with the changes made to independent claim 30.

With respect to claim 46, it should be noted that the GEE reference does not use a rotor position sensor, while claim 46 calls for a rotor position sensor, so GEE clearly does not teach in the direction of this claimed structure. The same is true of claim 47 and claims dependent thereon.

CLAIM REJECTION-SECTION 102

GEE & THORN/EMERSON ELECTRIC (USP 4,743,815) discloses a three-phase motor with a control scheme based upon the Zero-Crossing points (ZR) of the induced voltage (see col. 4, line 15). The DC power supply voltage(col. 4, line 28) increases with increasing rotation speed. The motor uses phase-chopping control, i.e. the turn-on instant is after the associated zero crossing point (see col. 8, line 12). Thus, the GEE motor belongs in the "late ignition" genre, not the "ignition advance" genre of the present invention. Upon each zero passage of the induced voltage, an interrupt is generated by the monoflop 37 of FIG. 4 (see col. 6, lines 28-29) or alternatively, by gate G15 of FIG. 6.

FIG. 2 shows the induced voltages ("back-EMFs") VAN, VBN and VCN in phases A, B, and C, with reference to neutral point N.

The bottom trace in FIG. 2 shows the zero passages ZR and the points NG where the induced voltage reaches its negative maximum. The commutation happens in this sector between ZR and NG, as described at col. 4, lines 18-33. The "ignition angle" measured after ZR, is designated THETA (see col. 7, lines 66ff). For it, a potentiometer is used to set a "commanded phase angle" THC (col. 8, lines 1-8). This angle determines the power of the motor.

At startup, no induced voltage is present, so the motor operates under "open loop" control. This is shown in FIGS. 7A and 7B, on the left side of each. Beginning at a specified RPM, the flag BSYNCC is set to 1 (FIG. 7C, bottom), and thereafter the motor operates under "closed loop" control, as a function of the induced voltage or back-EMF.

The description in GEE is, to a great degree, unclear and non-enabling. The command or target value for the phase chopping angle THETA is designated THC and set manually using a potentiometer, not shown (col. 8, lines 4-5 and 27-28). The comparison of THC and THETA is shown in FIG. 7A.

It is unclear, how the motor can start at all. The routine of FIG. 7A is executed 120 times per second (col. 7, lines 50-56). If the motor is still, one naturally cannot detect a zero passage, so it is unclear how a start is possible. Perhaps turning by hand?

From the foregoing, it should be apparent that about all the GEE disclosure has in common with the present invention is the use of interrupts in an electronic commutation-control circuit of a DC motor; GEE fails to teach or suggest the other features of claims 1-9, 30-38, and 43-51, as amended. The section 102 rejection must therefore be reconsidered and withdrawn.

CLAIM REJECTION-SECTION 103

Dependent claims 39-42 were rejected as unpatentable over GEE, combined with "Official Notice" that those in the computer control arts know when to execute non-critical process steps. Dependent claims 39-42 incorporate by reference the six method steps recited in independent claim 30. Contrary to the recitations on page 10 of the First Action, GEE col. 7, lines 36-63, do not disclose ascertaining first and second time intervals as recited in steps c) and e) and GEE does not talk about rotation-speed-dependent variables which are **inversely** proportional to rotation speed. At most, GEE mentions frequency FRQ which is **directly** proportional to rotation speed. Therefore, GEE does not provide **the predicate** to dependent claims 39-42, much less suggest the **additional** features recited in claims 39-42.

With respect to claim 39, the Office has not pointed to any mention in GEE of "non-time-critical process steps," much less to a teaching of **when** to execute such steps.

Claim 40 further specifies calculation of a "rotation-speed-dependent value" which is not mentioned in GEE col. 7, lines 36-63.

Claim 41 recites loading a startup value from a non-volatile memory, of which no mention in GEE has been cited.

Claim 42 recites modifying the contents of the non-volatile memory of claim 41, via a bus connection. No bus connection and no content-modification step in GEE have been cited.

The Office is requested to reconsider the section 103 rejection, in the light of the amendments made, and in the light of the Ex parte Scott & Lin decision of the Board of Appeals concerning "Official Notice" taken in S.N. 09/392,276, now USP 6,727,578, issued 27 APR. 2004. In that case, the Board found that the Examiner's "Official Notice" rejection was based on impermissible hindsight reasoning.

CONCLUSION

In view of the foregoing amendments and comments, it is respectfully submitted that claims 1-9 and 30-51 are now clear, and patentably distinguish over GEE et al., WILLIAMS, ENSOR, LE, CROOK, NAKANISHI, RICKER, KRAUSE, and the other art of record.

If the Examiner detects any remaining informalities which need to be corrected to place the application in condition for allowance, a telephone call to Applicant's counsel is invited.

With respect to PTOL-326, item 12 (Foreign Priority), the Examiner is requested to confirm that the World Intellectual Property Office (WIPO) has confirmed to the US PTO that a copy of the German priority document, DE 198 45 626.3 of 5 OCT. 1998 was timely filed in International Application PCT/EP99/05282, of which the present application is the US National Phase. Form PCT/DO/EO/903 indicated a Priority Document was received.

An extension petition and fee are submitted herewith; if any **additional** fee is necessary, please construe this paper as a Petition therefor, and charge the fee to Deposit Account 23-0442.

Respectfully submitted,

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